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Appendix H1

Summary of WAG ERAs Sites of Potential Ecological Concern for OU 10-04 Site Wide Ecological Risk Assessment

CONTENTS

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H1-1. COMPILATION OF WAG ECOLOGICAL RISK ASSESSMENT RESULTS

A primary requirement for the Operable Unit (OU) 10-04 Ecological Risk Assessment (ERA) problem formulation is to compile and evaluate results from individual Waste Area Group (WAG) ERAs. The WAG level ERAs are the second phase in a three-phase approach in the Idaho National Engineering and Environmental Laboratory (INEEL) ERA process; the third phase is the OU 10-04 assessment.

This appendix discusses the sites of concern identified in each of the WAG ERAs and summarizes the results site by site. An associated white paper discusses the development of contaminants of potential concern (COPCs) for OU 10-04 from the WAG ERA results.

INEEL hazardous waste sites have been systematically divided into smaller, more manageable waste areas groups through a Federal Facility Agreement and Consent Order (FFA/CO) between the U.S. Environmental Protection Agency (EPA), State of Idaho, and U.S. Department of Energy Idaho Operations Office (DOE-ID) in December 1991. The FFA/CO divides the INEEL into 10 WAGs to facilitate environmental remediation efforts. WAGs 1 through 9 generally correspond to INEEL operational facilities, while WAG 10 consists of the Snake River Plain Aquifer and those surface and subsurface areas not included in the bounds of the facility-specific WAGs. Within a WAG, the multiple locations or sites of contamination (also known as "potential release sites") are grouped together by similar contamination problems or boundaries and called operable units. Sites range in size from large facilities to small rubble piles and also include pits, percolation ponds, landfills, septic systems, injection wells, trenches, and abandoned tanks. Tables H1-1 through H1-7 in attachment H1-1 of this appendix present the WAG summaries by site and contaminant.

H1-2. WAG 1

H1-2.1.1 WAG 1 Description

WAG 1 consists of several subareas at Test Area North (TAN) including the Technical Support Facility (TSF), Water Reactor Research Test Facility (WRRTF), Loss-of-Fluid Test (LOFT) Facility, Initial Engine Test (IET) Facility and Specific Manufacturing Capability (SMC) Facility.

The TSF consists of facilities for handling, storage, examination, and research and development of spent nuclear fuel. The Process Experimental Pilot Plant (PREPP) is also located at TSF. The IET was designed as a testing location for the nuclear jet engines developed in the 1950s and early 1960s and was abandoned. This site is currently undergoing decontamination and decommissioning (D&D). LOFT and SMC are contiguous facilities west of TSF that consist of structures built for those two operations and old buildings from the Aircraft Nuclear Propulsion program. LOFT is a facility constructed for nuclear reactor tests that has been decommissioned. SMC is an active facility manufacturing components for the U.S. Department of Defense nonnuclear weapons system. WRRTF facility consists of two buildings that have supported several nonnuclear tests, mainly for simulation and testing water systems used in reactors.

Potential release sites assessed at WAG 1 include underground storage tanks, spills, disposal sites, pits, ponds, waste disposal systems, rubble disposal sites, and injection well(s). Hazardous, radioactive, and mixed waste exist at those sites. WAG 1 is divided into 10 OUs consisting of 71 sites. Possible contaminants include asbestos, petroleum products, acids and bases, and radionuclides.

H1-2.1.2 WAG 1 ERA Results

The WAG 1 ERA was performed in Section 7 of the comprehensive Remedial Investigation/Feasibility Study (RI/FS) for WAG 1 (DOE-ID 1997a). This WAG delayed final evaluation of sites of concern until the OU 10-04 ERA. Attachment H-1 presents a summary of the sites potential of concern for ERA.

H1-2.1.3 TSF-07 (OU 1-06: Disposal Pond)

TSF-07 is an unlined disposal pond located southwest of the TSF. The TSF-07 site encompasses a total area of approximately 35 acres, of which 5 acres in the northeast corner and on the eastern edge are believed to be contaminated with radionuclides and metals. The remaining 30 acres have never received wastewater and are not contaminated, based on available screening data. The TSF-07 pond is unlined and surrounded by a 1.5-m (5-ft) berm. The active portion of the pond consists of a 1.5-acre main pond along the eastern edge. The overflow pond in a 1-acre pond along the northeast edge of the berm has rarely been used. The TSF-07 disposal pond replaced the TSF-05 injection well and began receiving wastewater in September 1972. No radioactivity above background values was detected in a field survey of the western half of the TSF-07 pond performed in 1993. These results are interpreted to indicate that this end of the pond has not been used and that contaminants are not migrating horizontally from the contaminated eastern end of the pond.

The pond received wastewater from a variety of sources, including sanitary waste discharges, low-level radioactive waste, cold process water, and treated sewage effluent originating from TAN service buildings and processes and, more recently, a one-time release of 40,000 gal of treated wastewater from TAN-726. Borated water was also transported from the LOFT facility and poured into a manhole leading into the pond when LOFT was operational. The wastewater was piped to and mixed in a common sump (TAN-655) and subsequently pumped to a concrete inlet basin in the northeast corner of the TSF-07 disposal pond. Wastewater was discharged to TSF-07 via a drainage ditch. The sediment thickness in the pond has been estimated to range from 7.5 m (24.5 ft) at well No. TAN-9 to 19.5 m (64 ft) at well No. TSFAG-07 with an average thickness of 13.7 m (45 ft).

Based on the sampling results, an estimated 5 acres in the eastern and northeastern corner of the pond are known to be contaminated. The highest levels of contamination are found along the drainage ditch from the inlet basin in the northeast corner of TSF-07 to the main pond along the eastern berm. The main disposal pond is approximately 192 by 30.5 m (630 by 100 ft) or an area of 5,856 m^2 (63,000 ft^2). The overflow pond is approximately 131 by 24 m (430 by 80 ft) or an area of 3,144 m^2 (34,400 ft^2).

Conclusion of the Track 1 report is that vertical migration of contamination has occurred as evidenced by the elevated concentrations of metals in subsurface samples. The elevated radionuclide contamination appears to have occurred from the surface sediments to approximately 3.4 m (11 ft) below ground surface (bgs). Infiltration of wastewater at the site has likely increased the mobility of the metals and radionuclide contaminants that are routinely considered immobile (i.e., Cs-137). Organic contamination is assumed to be limited to the top 1.5 m (5 ft) of pond sediment with the exception of isolated acetone and methylene chloride detections at depth. Limited observations of contaminants in the perched water (i.e., Sr-90) also substantiate the sorption of contaminants within the pond sediments and underlying soil. The horizontal extent of contamination is limited to the main and overflow ponds. Contamination outside the TSF-07 has not been detected by field surveys (DOE-ID 1997a).

H1-2.1.4 TSF-08 (OU 1-06: Mercury Spill)

TSF-08 Area 13B, a mercury spill, is located near the southwest corner of TAN-07. Mercury was used extensively at TSF-08 from the late 1950s to the early 1960s. The Heat Transfer Reactor Experiment (HTRE)-III, part of the Aircraft Nuclear Propulsion program, used mercury as shielding for its reactor. From about 1959 to 1987, the HTRE-III engine was removed frequently along the railroad spurs between the test area at the IET facility and the maintenance area at TAN-607 and TAN-647. The units were stored on the track near TAN-647 from the mid-1960s to 1987. It is reported that mercury leaked from the HTRE-III engine onto the ground and railroad system every time the unit was moved and that mercury beads were found on the soil near the TAN-647 storage location in the mid-1980s. Also, a large spill of mercury (3,028 to 3,785 L [800 to 1,000 gal]) reportedly occurred near the southwest corner of TAN-607 in 1958. Mercury spills were collected in buckets or simply vacuumed up until 1978. From 1978 to present, spills were also monitored for gamma emitters before being collected. Since 1978, no collected mercury in the TSF area has been radiologically contaminated. The HTRE-III engine shield system contained a maximum of 19,782 kg (53,000 lb) of mercury, and mercury levels were maintained at capacity whenever the unit was moved.

Based on the sampling results, contamination at TSF-08 Area 13B is assumed to be present at relatively low levels across the site with area dimensions of 16.4 by 4.6 m (54 by 15 ft). Previous sampling and analysis indicate mercury contamination 4 ft bgs. The presence of mercury that was originally spilled on the ground surface at 4 ft bgs indicates vertical migration. Therefore, the vertical extent of mercury contamination is conservatively assumed to occur from 0.76 m (2.5 ft) bgs to a depth of 3.0 m (10 ft). The concentration is conservatively assumed to remain constant over the soil profile at the maximum detected concentration for the site because the soil profile was not further characterized during the Track 2. Cs-137 was detected slightly above background, and low activity of Co-60 is assumed to be limited to the 0.76-m (2.5-ft) to 1.5-m (5-ft) because of relative immobility in the environment (DOE-ID 1997a).

H1-2.1.5 WRRTF-01 (OU 1-03: Burn Pits)

The WRRTF-01 Burn Pits are located approximately 823 m (2,700 ft) north of WRRTF-01, outside the WRRTF perimeter fence. These burn pits were used for open burning of combustible waste generated at the TAN facilities from 1958 to 1975 and involved four separate areas (Saint-Louis 1986 and Meyer et al. 1992). Burn Pit I opened after the TSF-03 Burn Pit was filled and received both combustible solids and liquids from 1958 to 1964. Burn Pits II and III were opened after Burn Pit I was filled and operated from 1964 to 1970. Burn Pit II also may have received only combustible solids while Burn Pit III received only combustible liquids. (These liquids consisted mainly of oil from the glass windows at the TAN Hot Shop and the isopropyl alcohol used to clean this oil off the windows during replacement.) Burn Pit III also received petroleum products. Burn Pit IV was opened after Burn Pit II was filled and received mainly combustible solids and some reportedly noncombustible solids (automobiles, metal goods, etc.). Minor amounts of combustible liquids may have been disposed of in Burn Pit IV. The sites have been backfilled, and vegetation has been reestablished; however, at Pits I, II, and IV, subsidence control has not been maintained.

The normal operating procedure employed at the burn pits was to incinerate each time material was disposed in the pits. Therefore, it is likely that most of the volatile and semivolatile hazardous materials would be thermally destroyed and dissipated. The main constituents of concern at the WRRTF-01 Burn Pits are chromium, lead, and mercury because these contaminants were used in large quantities at the TAN facilities during the use of the burn pits and are the most likely to be present at the sites. Radionuclides are not suspected to have been disposed of in the WRRTF burn pits in large quantities because other protocols existed for disposal of radioactive waste. However, these pits operated from 1958 and 1975, and research involving radionuclides was being performed at TAN. As a result of this

research, the potential for radionuclide contamination was addressed in the field sampling plan (FSP) for the burn pits.

Track 2 data collection was conducted at the WRRTF-01 Burn Pits during June 1992. Four borings were drilled at WRRTF Burn Pits I, II, and III. Eight borings were drilled at WRRTF-01 Burn Pit IV because of its longer length. The total number of borings drilled was 20. For each boring, the entire depth of the burn layer was continuously sampled in increments of 0.6 m (2 ft), using a split-barrel sampler. Each split-barrel sample was field screened for volatile organic compounds (VOCs) and radiation. A composite sample of the burn layer was collected for chromium, lead, and mercury analyses. The remaining portion of the split-barrel was retained for gross alpha and beta, gamma spectroscopy, VOCs, and headspace analyses. Semivolatile organic compound (SVOC) analysis was also performed on samples collected from the WRRTF-01-III burn pit. In addition, as part of the Track 2 investigation, a geophysical survey was performed to better define the burn pit boundaries (DOE-ID 1997a).

H1-2.1.6 WRRTF Burn Pit I

The interval contaminated with organics in the burn pit is assumed to be from 0.61 m (2 ft), which is the minimum soil-cover-thickness depth, to a maximum depth of 67 m (22 ft). The assumption is based on the presence of tentatively identified compounds (TICs) in samples collected at 4.9 m (16 ft) and the likely soil horizon thickness. For metals and radionuclides, the contamination interval is assumed to be from 0.61 m (2 ft), which is the minimum soil cover-thickness depth to 2.1 m (7 ft). Since no metals or radionuclides were detected below the burn layer in samples at concentrations higher than INEEL background values, the 2.1 m (7 ft) is considered the maximum burn layer thickness. These assumptions are considered conservative, based on the sample analysis results (ppb TIC concentrations detected in the deepest sample), using WRRTF-01 IV boring data to establish a likely maximum soil horizon thickness and using the minimum soil cover and maximum burn layer thickness for the entire burn pit. An additional conservative assumption used in defining the nature and extent of contamination is that, although a particular contaminant may not have been detected in all samples, the entire burn pit is considered to be contaminated (DOE-ID 1997a).

H1-2.1.7 WRRTF Burn Pit II

The interval assumed to be contaminated with organics (2-propenylcyclohexane) is from 0.61 m (2 ft), which is the minimum soil-cover-thickness depth, to 1.5 m (5 ft), which is the maximum burn-interval-thickness depth. This assumption is supported by the lack of organics detected in soil samples collected below the burn layer in all four borings. The interval contaminated with inorganics is assumed to be from 0.61 to 6.7 m (2 to 22 ft), which is the maximum sampling depth, to 6.7m (22 ft), (which is the likely maximum soil-horizon-thickness), because mercury and chromium were detected in a sample collected 5 ft (1.5 m) below the burn layer. Radionuclide contamination is assumed to be present in the same interval assumed to be contaminated with inorganics, based on the detection of the metals at the 4.9-m (16-ft) depth, although samples were collected for radionuclide analysis only from the burn layer. These assumptions are considered to be conservative, based on previous limitations discussed in the Burn Pit II section (DOE-ID 1997a).

H1-2.1.8 WRRTF Burn Pit III

The burn pit interval, assumed to be contaminated with ethylbenzene, toluene, trichloroethene, acetone, fluorene, phenanthrene, fluoranthene, 1,1,1-trichloroethane, U-234, and U-238, is from 0.91 to 3.7 m (3 to 12 ft), which is the minimum clean-soil-cover depth of using the average burn-layer thickness of 2.7 m (9 ft). The interval from 0.91 m (3 ft), which is the depth of the layer of the minimum soil-cover thickness, to 6.7 m (22 ft), and the upper surface of basalt, assumed to be contaminated with xylene, 2-hexanone, 4-methyl-2-pentanone, naphthalene, 2-methylnapthalene, acenaphthene, dibenzofuran,

anthracene, fluoranthrene, VOCs detected as TICs, and lead. These assumptions are considered to be conservative based on previous limitations discussed in the Burn Pit II section (DOE-ID 1997a).

H1-2.1.9 WRRTF Burn Pit IV

The burn pit interval, assumed to be contaminated with chromium, lead, cobalt-60, xylene, and VOCs detected as TICs, is from 0.46 to 2.3 m (1.5 to 7.5 ft), which includes the average clean-soil thickness and the average burn-layer thickness. No contaminants above INEEL background concentrations were detected in the samples collected above the burn layer. Using the average thickness for the clean-soil layer and burn layer to determine the contaminated interval thickness is considered conservative, based on previously discussed limitations (DOE-ID 1997a).

H1-2.1.10 WRRTF-13 (OU 1-08: WTTRF Fuel Leak)

There have been numerous diesel and heating fuel tanks and transfer lines used at WRRTF during its operational life. Most of these tanks and lines have been taken out of service and removed. Currently, there is one active diesel fuel tank at WRRTF, a 22,711-L (6,000-gal) stainless steel tank, that replaced Tank TAN-738 when it was removed in 1991. Residual contamination remains in the subsurface because of leaks and spills of diesel fuel at the former locations of tanks TAN-738, TAN-739, and TAN-787 and the transfer piping between tanks TAN-787 and TAN-738.

When the 3,785-L (1,000-gal) stainless steel tank, TAN-739, was removed in 1990, approximately 22.9 m^3 (32 yd^3) of contaminated soil was also removed. Because of the possibility of damaging a second underground storage tank (UST) located near the tank, not all of the contaminated soil present was removed. Analytical results for samples collected from the tank excavation following the tank removal indicate diesel fuel contamination remained in the soils below the excavation. TAN-738, located approximately 3 m (10 ft) east of TAN-739, was installed in 1959 and was used to supply heating oil to the boilers in Building TAN-641. In 1963 Tank TAN-787 was installed. It was connected to Tank TAN-738 in 1976 when a 3.8-cm (1.5-in) stainless steel line was installed, along with new boilers in Building TAN-641. The tanks and piping remained in active service until 1991. There are no documented instances of leakage from the tanks, although there are anecdotal reports that diesel fuel was spilled during refueling operations on occasion.

TAN-738 was taken out of service in September 1991, and the transfer line was modified to allow the boilers in TAN-641 to be fed directly from Tank TAN-787. When taken out of operation, the condition of tank TAN-738 had deteriorated, but the tank still contained oil, which was transferred into tank TAN-787. During a startup test of the boilers in October 1991, an estimated 7,949 to 13,627 L (2,100 to 3,600 gal) of diesel fuel was unaccounted for. It was suspected that either a transfer line was leaking or that the boiler meters were not functioning properly. A pressure leak test indicated that a portion of the transfer piping was leaking. Tank TAN-787 was not suspected of leaking because tank gauge measurements appeared to be accurate, based on the changes measured during the transfer of oil in 208-L (55-gal) drums from TAN-738 to TAN-787. During excavation of the transfer line, the soil below the piping appeared discolored and smelled strongly of petroleum products, although only three small holes were found in the piping itself. Soil sampling and analysis indicated substantial soil contamination below the pipeline.

Tanks TAN-738 and TAN-787 were removed in December 1991. When removed, TAN-738 contained numerous small holes, and soil below the tank both smelled and appeared contaminated with diesel fuel. Analytical results for samples collected from the tank excavation indicate that diesel fuel contamination is present in the soils below the excavation. When TAN-787 was removed, the excavation appeared contaminated, although photoionization detector readings ranged only from 0 to 310 ppmv on

the samples taken from the excavation. Analytical results for the excavation soil samples indicate diesel fuel contamination in the soils.

Based on the sampling results, although different analytical techniques were used during the 1990 to 1991 sampling events and the 1994 to 1996 sampling events, similarities and differences between the individual data sets can be seen, including the following:

- Benzene was not detected in any of the 41 samples collected, and concentrations of ethylbenzene were very low or nondetectable in all sampling events.
- The total petroleum hydrocarbon (TPH) was consistently detected at higher concentrations than other analyzed contaminants.
- Concentrations of toluene, generally very low or nondetectable, were much higher in the samples collected from below the transfer piping in 1991, perhaps indicating more recent contamination, such as the 6,426 L (3,600 gal) of fuel lost turning the boiler startup testing.
- Concentrations of all contaminants appear lower below TAN-739. This may be a result of the removal of 24.5 m^3 (32 yd^3) of contaminated soil prior to sampling and indicates that contamination below TAN-739 may decrease with depth. Concentrations of contaminants detected in the contaminated region in Borehole No. 3 in 1996 are also lower, perhaps as a result of the increased distance from the contamination source (the small holes in the transfer piping).

The results of the Track 2 and RI borehole sampling appear roughly consistent with the results of the 1994 soil vapor survey and indicate that more than one source of diesel fuel contamination exists at the site. Each tank and the transfer piping represent a discrete source of contamination. The contaminated soil volume of 705 m^3 (952 yd^3) was calculated by assuming that the contamination is evenly distributed below the approximately 28 m (92 ft) of piping in which holes were found in 1991. The sampling and analysis results for Borehole No. 3, drilled in 1996, suggest a cone of contamination below the pipeline, extending out approximately 3 m (10 ft) on either side at the basalt interface.

Because the soil vapor survey results do not indicate extensive contamination below the three removed tanks, the contaminated regions below these tanks are assumed to be localized directly below the tanks. If it is assumed that the contaminated regions below the tanks are a block extending one tank width beyond the tanks on each side, then the volume of contaminated soil would be 642 m^3 839 yd^3). The contaminants detected at the site during the various sampling events are phenanthrene, acenaphthene, anthracene, pyrene, ethylbenzene, xylene, indeno(1,2,3-cd)pyrene, naphthalene, fluorene, fluoranthene, and 2-methylnaphthalene. TPH and phthalate, both qualitative parameters, have also been detected (DOE-ID 1997a).

H1-3. WAG 2

H1-3.1.1 WAG 2 Description

WAG 2 is the Test Reactor Area (TRA). This facility was designed to study the effects of radiation on materials, fuels, and equipment. The Advanced Test Reactor (ATR) is the only large reactor still operational within TRA. It is designed to produce a neutron flux that allows simulation of long-duration radiation effects on materials and fuels. It also produces isotopes for use in medicine, research, and industry.

Potential release sites evaluated in the WAG 2 ERA include leaching ponds, USTs, rubble piles, cooling towers, an injection well, french drains, and assorted spills where hazardous and radioactive wastes may exist. WAG 2 is divided into 10 OUs consisting of 51 potential release sites. Possible contaminants include petroleum products, acids, bases, polychlorinated biphenyls (PCBs), radionuclides, and heavy metals.

H1-3.1.2 WAG 2 ERA Results

The WAG 2 ERA is presented in Section 6 of the *Comprehensive RI/FS for the Test Reactor Area OU 2-13 at the INEEL* (DOE-ID 1996a). This WAG delayed final evaluation of sites of concern until the OU 10-04 ERA. Attachment H-1 presents a summary of the sites of potential concern for the ecological risk assessment.

H1-3.1.3 TRA-03 (OU 2-10: Warm Waste Pond Sediments)

The source of the contamination in the Warm Waste Pond (WWP) sediments was the warm wastewater discharge to the cells of the pond. In addition, radiologically contaminated material from the OU 2-10 Interim Action (IA) has been placed into the 1952 cell, and radiologically contaminated soil from the OU 10-06 removal action has been placed into the 1957 cell.

An IA for the WWP sediments was conducted in 1993. Sediments that exceeded the action level of 690 pCi/g for Cs-137 were excavated from the sidewalls and base of the 1964 cell and placed into the 1952 cell. Following the excavation, the cleaned 1964 cell was covered with approximately 10 ft (3 m) of clean fill. The 1952 cell also received material generated during the 1992 removal action to clean up the windblown soil contamination in the vicinity of the WWP. The 1952 cell was covered with 1 ft (0.3 m) of clean fill. The 1957 cell sidewall sediments, along with residual 1992 stockpile material, were scraped into the base of the 1957 cell, and it was covered with a layer of at least 0.5 ft (0.1 m) of clean fill. The 1957 cell was not capped, because this cell is also proposed to be used for disposal of other INEEL radiologically contaminated soil.

Previous site investigations indicate that sediments in the pond bottoms and sidewalls were contaminated to a depth of approximately 2 ft (0.6 m). Following the IA, the horizontal extent of contamination is confined to the areas of the 1952 and 1957 cells. The vertical extent of contamination is confined to a depth approximately 2 ft (0.6 m) below the base of the 1952 and 1957 cells.

The 1952 and 1957 cells of the WWP contain contaminated soil materials from various sources, including contaminated sediments from the original warm wastewater disposal to the cells, contaminated soil and asphalt from the 1992 stockpiles, contaminated materials from the 1993 WWP IA and contaminated soil from the 1995 OU 10-06 removal action. The 1993 IA materials included sidewalls from the 1952 and 1957 cells, the sediments from the 1964 cell, and the contaminated structure formerly located east of the 1952 and 1957 cells. The contaminated soil from the 1995 OU 10-06 removal originated from the North Storage Area (NSA), Boiling Water Reactor Experiment (BORAX), TAN, and Argonne National Laboratory-West (ANL-West).

The 1964 cell of the WWP was remediated during the 1993 WWP IA. During this IA, most of the contamination that was disposed in the cell was excavated and transferred to the 1952 cell, and any of contamination that was not removed was buried under approximately 10 ft (3 m) of clean soil. As a result, any remaining contamination in the 1964 cell is too deep to affect any of the surface exposure routes evaluated in the baseline risk assessment (BRA) (DOE-ID 1996a). Containment was accomplished with an engineered soil cover and institutional controls were put in place. Occupational access for more than 30 years was restricted to industrial land use only or until the residential risk is <1E-04.

H1-3.1.4 TRA-04/05 (OU 2-11: Retention Basin Sediments)

The Retention Basin received wastewater routed to the WWP and was designed to delay passage of reactor system flush water, allowing sufficient time for radionuclides with a half-life of less than a few hours to decay. It has been known that the basin has been leaking since the 1970s because there have been a number of documented releases from the Retention Basin in the past, including pipeline leakage and leakage from the basin at a rate estimated to be as much as 86,000 gal (325,526) per day. Contamination from the basin migrates through the vadose zone and enters the Perched Water System (PWS) beneath TRA. The surficial alluvial sediments around the basin are contaminated with acrylonitrile, metals, and radionuclides similar to those found in the WWP. The surficial sediments are approximately 40-ft (12.2-m) thick, overlying basalt, in this area.

The COPC concentrations evaluated in the BRA for the Retention Basin sediments were calculated from results obtained during the 1990 site investigation of the Retention Basin. All of the COPCs in the two site decision units are contained in the Retention Basin, because the Track 2 investigation of the TRA-05 injection well concluded that the well's sediments do not contain any COPCs. The COPC concentrations used to estimate the TRA-04/05 risk in the BRA are the 95% upper confidence levels (UCLs) on the mean or maximum concentrations, whichever was less, from the 1990 site investigation data set.

During the site investigation, samples were collected at three separate depth intervals; 0–6 in. (0-15.2 cm), 0–4 ft (0–1.2m), and 0–10 ft (0–3 m). Concentrations of samples from the 0–10-ft (0–3-m) interval were used to calculate the 0–10-ft (0–3-m) average, and all of the samples, regardless of depth, were used to estimate the COPC masses that may be available for transport to groundwater (DOE-ID 1996a).

H1-3.1.5 TRA-06 (OU 2-13: Chemical Waste Pond)

Contamination associated with the Chemical Waste Pond (CP) sediments is primarily a result of past disposal practices from the demineralization plant. The CP is an operating disposal unit and consists of an unlined surface impoundment, which receives effluent containing mineral salts from the demineralization plant. In addition, solid and liquid wastes were disposed directly into the pond in the past. This disposal included corrosives and other waste. Accurate records were not kept and details of the disposals are not known. Possible disposal of pesticides, solvents, PCBs, and biocides are suspected, but not documented.

The most recent release of hazardous materials to the CP occurred during May through June, 1995 when approximately 287,100 gallons of liquid, used to neutralize and flush out-of-service acid and caustic tanks (TRA-731B, C, D, and E), were disposed to the CP. After the disposal, it was determined that the disposed liquid contained 0.3 ppm of mercury (Hg), which is above the toxicity characteristic leaching procedure (TCLP) limit for D009 mercury hazardous waste (the TCLP limit for D009 waste is 0.2 mg/L). The total mass of Hg contained in this inadvertent liquid release is estimated to be approximately 3.26E+05 mg. The total mass of Hg contained in the CP from all past disposal operations is estimated to be 8.0E+07 mg, so the Hg contribution from the inadvertent release is relatively small and it is not expected to increase human health or ecological risks at the site.

In addition, Tanks TRA-731E and TRA-731D leaked during the flushing operations. Tank TRA-731E leaked approximately 1,000 gallons (3,785 L) of liquid that had a measured chromium concentration of 3.93 ppm, and Tank-731D leaked approximately 500 gallons (1,893 L) of liquid that had a measured mercury concentration of 1.81 ppm. The leaked liquid was collected in a nearby trench that had dimensions of approximately 1 ft × 100 ft (0.3 m × 30.5 m).

Hazard quotient (HQ) calculations were performed for these two spills, and the resulting values were shown to be several orders of magnitude less than the National Oil and Hazardous Substance Pollution Contingency Plan (NCP) limit of HQ = 1. The calculations were performed, assuming that all contamination contained in the release liquid was deposited in a soil depth of 3 ft (0.9 m) beneath the trench. The total calculated HQs for the two contaminants were 8E-04 for the chromium release and 3E-03 for the mercury release.

Based on the 1990 results of the Track 1 investigation, the preliminary contaminants of concern (COCs) in the CP were considered to be Hg, barium (Ba), and PCBs. The maximum concentrations of Hg (133 mg/kg) and Ba (3,830 mg/kg) were from samples collected in the area where standing water occurs. This is consistent with the wastewater discharge and flow in the pond. Both Hg and Ba are detected in the surface sediments at much higher concentrations than background. The average concentration of Hg exhibited a rapid decrease in measured concentration with depth. The Ba also showed a decrease, and the average concentration at the 10–16-ft (3–5-m) interval was less than background level. PCBs were detected in 20 samples collected from the surface sediments at an average concentration of 0.08 mg/kg, and a maximum concentration of 0.33 mg/kg. PCBs were not detected in subsurface samples.

Because a risk assessment had not been performed in 1990, all analytes tested in the Track 1 investigation are evaluated in Section 5 of the WAG 2 RI/FS. Previously, many analytes were considered to be below the background adjacent to the CP, and only the two metals (Ba and Hg), plus PCBs (aroclor-1260), were considered to be contaminants. Following the contaminant screening, the COPCs used in the BRA at the CP are metals, SVOCs, PCBs, and anions.

The COPC concentrations at the CP evaluated in the BRA were calculated from 1990 sampling data. The COPC concentrations are the 95% UCLs on the mean or maximum concentrations, whichever was less.

For most COPCs at TRA-06, samples were collected from 0–6 in. (0–15.2 cm) and from depths greater than 10 ft (3 m). As a result, the concentrations for the three depth intervals evaluated in the BRA, i.e., 0–6 in., 0–4 ft, and 0–10 ft (0–15.2 cm, 0–1.2 m, and 0–3 m) were assumed to be the same for most of the CP's COPC. All samples collected at the CP, regardless of depth, were used to estimate the COPC masses that may be available for transport to groundwater (DOE-ID 1996a).

H1-3.1.6 TRA-08 (OU 2-09: Cold Waste Pond)

Low levels off gamma-emitting radionuclides were found on the pond berms in two samples collected by the Environmental Monitoring Unit in 1990. The maximum activity detected was 0.97 pCi/g Co-60, 0.39 pCi/g Cs-134, 23.7 pCi/g Cs-137, and 0.6 pCi/g Eu-154. The low levels of gamma-emitting radionuclides may be a result of windblown soil contamination from the WWP. Low levels of VOCs and metals were detected in the pond sediments, as a result of concentration of naturally occurring metals in the water during cooling tower operations.

No validated samples of pond sediments have been collected at the Cold Waste Pond (CWP) as part of the RI. Estimated concentrations were calculated by determining the mean effluent liquid concentration of each COPC, estimating the COPC sediment concentration that would result from equilibrium partitioning with these liquid concentrations, and summing the calculated sediment concentrations with background concentrations reported in the INEEL Track 1 guidance manual. These calculations assumed that all contaminants contained in the effluent were deposited in the top 6 in. (15.2 cm) of sediments and that the bulk density of the sediments is 1.9 g/cm^3. Since the sediment concentrations are not based on measurements, and in order to provide a conservative estimate of the

CWP's risk, the estimated concentrations were assumed to remain in all three depth intervals evaluated in the BRA i.e., 0-6 in., 0-4 ft, and 0-10 ft (0-15.2 cm, 0-1.2 m, and 0-3. m) (DOE-ID 1996a).

H1-3.1.7 TRA-13 (OU 2-09: Sewage Leach Pond-Berm and Soil Contamination Area

The COPCs at the Sewage Leach Pond (SLP)-Berm and Soil Contamination Area (SCA), also known as Windblown Contamination, are attributed to atmospheric dispersion of radionuclides contained in sediments of the WWP. When the sediments are exposed and dry, they become susceptible to wind erosion and transport. The radiological contamination on the north side of the southern berm of the 50-cell may have resulted from windblown SLP sediments and the WWP windblown sediments.

As part of the OU 2-13 field investigation, random samples were collected from 36 locations to characterize the SLP-berm and SCA. Samples were collected from the upper 4 in. (10 cm) of soil. Analysis of samples collected on the southern 50-cell berm indicated Cs-137 in the 18 samples collected, ranging from 3.8 to 29 pCi/g. Other gamma-emitting isotopes detected were Co-60, which ranged from 1.29 to 11.6 pCi/g, and Ag-108m, which ranged from 0.061 to 0.61 pCi/g. Am-241 was detected in only one berm sample at 0.14 pCi/g. The analytical data met the requirements of method Validation Level A.

Samples collected at random from locations in the remainder of the SLP-SCA in general had lower concentrations of radionuclide contamination. Gamma-emitting isotopes were detected in all samples in the following ranges: cesium (Cs)-137 (1.5-39 pCi/g), Co-60 (0.31-10.2 pCi/g), and Ag-108m (0.0095-0.72 pCi/g). Americium (Am)-241 was found in only three samples and ranged from 0.15 to 0.9 pCi/g. Only estimated values, below the detection limit, of strontium (Sr)-90 were reported for SCA samples. The analytical data met the requirements of method Validation Level A.

The maximum detected concentrations of Cs-137 and Am-241 were above the UTL for these radionuclides. No UTL has been established for the other two detected radionuclides: Co-60 and Ag-108m.

The vertical extent of contamination was not characterized. Windblown deposited radionuclides are generally restricted to the top few inches of soil. The horizontal extent of contamination was not completely characterized, because samples at the margins of the area also contained concentrations above the background UTLs. However, the contamination is shown to be concentrated on and adjacent to the south side of the southern berm of the 50-cell, with concentrations decreasing in samples located northwest of southeast of the 50-cell and in samples northeast of the 65-cell.

Contamination detected in the SLP itself is also attributed to windblown contamination. In 1991, sediments in the pond bottom were sampled for the Track 2 investigation and found to contain radionuclides and metals at concentrations greater than the background UTL values, and some organic contaminants. The metals found in the pond sediments included Ag, Ba, Be, Cd, Cr, Cu, Hg, Ni, Pb, and Zn. The SVOCs included pyrene, fluoranthene, phthalates, chrysene, benzo(b)fluoranthene, and 4-chloroaniline. The radionuclides included Ag-108m, Am-241, Co-60, Cs-134, Cs-137, Eu-152, europium (Eu)-154, plutonium (Pu)-239, Pu-240, Sr-90, and uranium (U)-234. Cs-137 was found in the 50-cell at a maximum concentration of 136 pCi/g. Complete data including ranges of concentrations are provided in the OU 2-09 Track 2 Summary Report.

The COPC concentrations evaluated in the BRA for TRA-13, SLP, were calculated from results obtained during the 1992 sampling of the SLP sediments. During this sampling event, samples were collected at various depths to a maximum of 4 ft (1.2 m) bgs. The concentrations used in the BRA for evaluation of surface pathway exposures are the 95% UCL on the mean or maximum concentrations, whichever was less, for each depth interval of interest (i.e., 0–6 in., 0–4 ft, and 0–10 ft [0–15.2 cm, 0–1.2 m, and 0–3 m]).

The SLP-Berm and SCA COPC concentrations evaluated in the BRA were calculated from results obtained during the 1995 OU 2-13 RI sampling of the berms and the SCA. The COPC concentrations are the 95% UCLs on the mean or maximum concentrations, whichever is less, from the 1995 sampling data set. Because the berm samples are biased samples, and the SCA samples were collected at random, combining the sample sets could result in the estimated UCL on the mean being biased high (DOE-ID 1996a).

H1-3.1.8 TRA-15 (OU 2-05: Soil Surrounding Hot Waste Tanks at TRA-613)

This site was contaminated by a leak in an underground tank (Tank 1) used to store radionuclide-contaminated liquids and chemicals from laboratory analyses. The Track 2 investigation determined that the leak from Tank 1 did not cause a risk. However, surface spills of hot waste streams are thought to have contributed contamination to the site.

The Track 2 investigation did not evaluate surface contamination, although radiological field screening results above background levels were encountered. Data from the surface soil collected from Soil boring No. 3 has been used to characterize the surface contamination for the BRA. The horizontal extent of contamination in the surface soil is not defined, but during a facility investigation in 1994, only low levels of Cs-137 to a maximum of 8.3 pCi/g were detected. The extent of contamination in the subsurface was characterized in the Track 2 investigation.

Twenty-six radionuclides and metals were detected around the tank basin. The highest concentrations of radionuclides detected were Cs-137 and Sr-90. Cs-137 ranged from 0.07 to 2,000 pCi/g and Sr-90 ranged from 0.05 to 2,280 pCi/g. Co-60 ranged from 0.21 to 50.3 pCi/g. All other radionuclides were less than 2 pCi/g.

Lead (Pb) was detected in all the samples and ranged from 4.9 to 225 mg/kg. The maximum concentration was approximately 5.5 times the baseline screening level, which was established for the Track 2 investigation at TRA and an order of magnitude greater than the UTL determined in Rood et al. (1995). Chromium (Cr) was detected from 4.45 to 31 mg/kg, and arsenic (As) was detected from 2.1 to 10 mg/kg. The maximum detected value for Cr is below the UTL, while the maximum concentration for As is less than two times the UTL.

Most of the contamination at TRA-15 is the result of a leak from former Hot Waste Storage Tank 1. This tank was buried approximately 13 ft (4 m) bgs, so any contamination is too deep to affect any of the surface exposure routes evaluated in the BRA. However, during the Track 2 investigation, some relatively small amounts of contamination were detected from 0–10 ft (0–3 m) in samples collected from one of the three soil borings. The COPC concentrations evaluated for the surface exposure pathways in the BRA are the maximum concentrations detected from 0–10 ft (0–3 m) in this one boring. For evaluation of the surface pathways, maximum concentrations were used in the BRA instead of 95% UCL concentrations, because at most, only three samples from the 0–10-ft (0–3-m) interval in the soil boring were analyzed for each COPC (DOE-ID 1996a).

H1-3.1.9 TRA-16 (OU 2-05: Soil Surrounding the Former Radionuclide-Contaminated Tank at TRA-614)

The 300-gal (1,135-L) UST at TRA-16 received waste from the metallurgy laboratory in TRA-614, and was connected to a hot sink and hood in the laboratory where enriched uranium was handled. Solvents that were used to clean fuel plates may also have been disposed to the UST.

Two confirmation soil samples were collected on the north and south ends from the base of the tank excavation [9 ft (2.7 m) bgs] following the tank removal. Mercury was the only COPC detected above background concentrations at this site. Therefore, it is the only COPC analyzed in the site's risk assessment. One of the two samples contained 0.24 mg/kg Hg, and the Hg results for the other sample were rejected during validation. Because of the small amount of data for the site, and in order to provide a conservative estimate of the TRA-16 risk, the 0.24 mg/kg Hg concentration was used for the three depth intervals in the BRA (DOE-ID 1996a).

H1-3.1.10 TRA-19 (OU 2-05: Soil Surrounding Rad Tanks at TRA-630)

Soil contamination was detected northwest of the Rad Tanks during the tank removal operation. The field screening data indicated varying subsurface soil concentrations of beta/gamma-emitting radionuclides. The subsurface contamination is presumed to be associated with leaking warm wastelines, rather than the tanks. No samples were collected for laboratory analysis, and the soil was not characterized. Thus, the horizontal and vertical extent of contamination has not been determined.

The warm waste in the line suspected of being the source of the contamination at the Rad Tanks is associated with the warm waste in the line that is the source of the contamination at the Brass Cap Area. Therefore, the Brass Cap Area is considered an analogous site, and data from the Unusual Occurrence Report (UOR) for the repair of the warm wasteline leak there is used to characterize the contamination at TRA-19, and to estimate human health and ecological risks at this site (DOE-ID 1996a).

H1-3.1.11 TRA-34 (OU 2-04: The North Storage Area)

The NSA was used to temporarily store equipment and materials such as reactor parts, pumps, and casks. The Hot Storage Area was used to store materials with low-level radionuclide contamination. The Hot Storage Building includes the Hot Storage Building (TRA-664) in the northeast corner, which contains radiologically contaminated materials that require protection from the environment. The majority of the material stored in the building is hardware with fixed contamination.

The OU 10-06 Phase II field investigation was conducted at the NSA to determine the nature and extent of radiologically- and inorganically-contaminated soil and to fill existing data gaps. The perimeter samples collected outside the boundary of the NSA to verify the horizontal extent of contamination indicated that the soil contamination was less than 5 pCi/g. However, the OU 10-06 removal action did not address soil along the fence line and field screening indicated the presence of radionuclide-contaminated soil outside the fence. Because radionuclide and inorganic COPCs are the result of the same storage practices, the inorganic contaminants are believed to occur in the same areas as the radionuclide COPCs.

A nontime critical removal action was conducted inside the fence during fall 1995. Sodium iodide detectors were used to guide the excavation activities, and confirmation samples were collected to verify the attainment of cleanup criteria. The cleanup criteria were set at 15 pCi/g for Cs-137, which is below the risk-based preliminary remediation goal of 16.7 pCi/g.

Since most of the soil contamination at TRA-34 was excavated during the OU 10-06 removal action, only OU 10-06 postremoval action sample data were evaluated in the BRA. These samples were collected from 0-4 in. (0-10.1 cm) bgs, and were used to identify five COPCs at the NSA (Ag-108m, Co-60, Cs-137, Eu-152, and Sr-90).

A varying number of samples were analyzed for each COPC. Specifically, one sample was analyzed for Ag-108m, five samples were analyzed for Co-60, 12 samples were analyzed for Cs-137, nine samples were analyzed for Eu-152, and 20 samples were analyzed for Sr-90. The 95% UCLs on the mean, calculated in accordance with the EPA's *Supplemental Guidance to Risk Assessment Guidance Supplement: Calculating the Concentration Term*, exceeded the maximum detected concentrations for all COPCs. As a result, the maximum detected concentration for each COPC was analyzed in the BRA.

Only one surface sample was collected at TRA-34, so the maximum 0-4 in. (0-10.1 cm) bgs concentration of each COPC was assumed to exist in all three depth intervals evaluated in the BRA (i.e., 0-6 in., 0-4 ft, and 0-10 ft [0-15.2 cm, 0-1.2 m, and 0-3 m]. This assumption produces a very conservative estimate of the NSA's residual human health and ecological risk.

The field screening indicates that the risk-based cleanup criteria were met for the removal action for the area inside the fence at the NSA, and the analytical results indicate that contamination remaining inside the fence is an order of magnitude below the criteria. Potential contamination in the area outside the fence has not been evaluated. The OU 2-13 Comprehensive Feasibility Study (FS) will recommend that field detection instruments could be used to survey the area and identify areas requiring remediation. Soil in these areas could be removed and consolidated into the WWP (DOE-ID 1996a).

H1-3.1.12 TRA-619, TRA-626, TRA-653 (OU 2-04: PCB Spills)

Low levels of PCBs remain in limited areas in soil surrounding the pads where transformers containing PCBs had been located. The source of the contamination at all three retained sites is oil leaks from the transformers. For each of the sites, a cleanup was performed, and soil was excavated. The highest concentration detected during confirmation sampling following the excavation of the three spill areas around the transformer pads is 24 ppm at TRA-626. These analytical data were not validated. All confirmation samples after the excavation activities indicated that the cleanup had achieved levels that are below the defined applicable or relevant and appropriate requirements for these sites (i.e., the 25 ppm limit set by Toxic Substances Control Act [TSCA]) and within the Office of Solid Waste Emergency Response (OSWER) directive guidance level of 25 ppm for residual PCBs at Superfund sites. The analytical data indicate that residual contamination of PCBs is present in shallow surface soil at concentrations greater than the calculated risk-based soil concentration of 0.08 mg/kg for soil ingestion for a residential cancer risk of 10^{-6}.

Although the vertical and lateral extent of PCB contamination has not been defined for any of these three sites, based on the release mechanism and mobility of PCBs, there is no reason to suspect that PCB contamination remains above the 25 ppm action level.

Aroclor-1260 is the only COPC evaluated in the BRA at TRA-619. The Aroclor-1260 concentration evaluated in the BRA was determined by calculating the 95% UCL on the mean for the six soil samples collected at the site after the November 1990 removal action (19.3 mg/kg). When the removal action was complete, the TRA-619 PCB spill site was covered with approximately 2 ft (0.6 m) of clean soil, so the 95% UCL concentration was assumed to exist in only the 0–4-ft (0–1.2-m) and 0–10-ft (0–3-m) depth intervals, which were evaluated in the BRA.

Aroclor-1260 is the only COPC evaluated in the BRA at TRA-626. The Aroclor-1260 concentration (24 mg/kg) evaluated in the BRA was the maximum concentration detected in the three samples collected at the site after the second removal action. The maximum concentration was used instead of the 95% UCL concentration because only three confirmation samples were collected. After the removal action was complete, the TRA-625 PCB spill site was covered with approximately 4 ft (1.2 m) of clean soil, so the maximum Aroclor-1260 concentration was assumed to exist in only the 0–4 ft (0–1.2-m) and 0–10 ft (0–3-m) depth intervals, which were evaluated in the BRA.

Aroclor-1260 is the only COPC evaluated in the BRA at TRA-653. The Aroclor-1260 concentration evaluated in the BRA was determined by calculating the 95% UCL on the mean for the six soil samples collected at the site after the September 1990 removal action (8.71 mg/kg). After the removal action, the TRA-653 PCB spill site was covered with approximately 2 ft (0.6 m) of clean soil, so the 95% UCL concentration was assumed to exist in only the 0–4-ft (0–1.2-m) and 0–10-ft (0–3-m) depth intervals, which were evaluated in the BRA (DOE-ID 1996a).

H1-3.1.13 Brass Cap Area

The source of the contamination at the Brass Cap Area is a leaking warm wasteline. Field surveys were conducted to determine the location of the leak. Soil in the area of the leak from an elbow in the wasteline was excavated, and the wasteline was excavated, as required.

The vertical extent of the soil contamination was determined by driving a hollow pointed pipe into the base of the excavation (2 m [7 ft]) and measuring the radiation levels inside the pipe. This 1985 investigation indicated a clear boundary between contamination and noncontaminated soil; the soil was contaminated to approximately 3 m (10 ft) bgs (Item 15 of UOR EG&G 1985a and Item 9 of UOR EG&G 1985b). Before excavation activities to repair the leak, the extent of migration of the radiological contamination at the surface and under the concrete was characterized, using field screening instruments (i.e., Ludlum 2A and Ludlum 14C) after core-drilling six 8-in. diameter holes through the concrete. The highest surface radiation levels were present directly above the elbow in the wasteline.

The average gamma radiation field measurements collected at the Brass Cap Area were used to calculate the following estimated radionuclide concentrations: 6,060 pCi/g Cs-137, 995 pCi/g Cs-134, 36.3 pCi/g Sr-90, and 36.3 pCi/g Co-60. In contrast, the radionuclide concentrations evaluated in the BRA are as follows: 19,500 pCi/g Cs-137, 3,330 pCi/g Cs-134, 833 pCi/g Sr-90, and 8.33 pCi/g Co-60.

The contaminant concentrations evaluated in the BRA differ from the concentrations listed above because of two errors that were made during development of the OU 2-13 Screening and Data Gaps Analysis (SDGA) Report. The first error involved the use of an incorrect conversion factor. The Unusual Occurrence Reports for the Brass Cap Area (UOR EG&G 1985a and UOR EG&G 1985b) list an estimated contaminated soil volume of 314 yd^3 at the site. This soil volume was incorrectly converted to 80 m^3 during development of the SDGA (the correct volume should have been 240 m^3), and the incorrect volume was used during calculation of contamination concentrations. As a result of this error, the calculated contaminant concentrations for the site were too high by a factor of 3.

The second error involved the use of conflicting information presented in the UORs. The UORs indicate that approximately 0.1 Ci of Sr-90 and 0.001 Ci Co-60 were released at the site, but the UORs also state that Sr-90 and Co-60 each make up 0.5% of the total released activity. The Sr-90 and Co-60 concentrations evaluated in the BRA are based on the 0.1 Ci and 0.001 Ci estimates, even though the 0.5% estimate is probably more correct. The reason for this conclusion is that Sr-90 and Co-60 have similar fission yields, and would probably have similar activities in the liquid that was released at the site. Using the 0.5% assumption, the Sr-90 and Co-60 activity that could have been released at the site would be 0.014 Ci for each isotope. The Sr-90 activity evaluated in the SDGA was greater that 0.014 Ci and the evaluated Co-60 activity was less than 0.014 Ci. This is because the Sr-90 concentration developed for the SDGA was overestimated and the Co-60 concentration developed for the SDGA was underestimated.

The concentrations developed for the SDGA (i.e., the second set of concentrations presented above) were used in the BRA for two reasons. First, the contamination at the site has never been directly measured, so the first set of concentrations may be no more accurate than the second set. The second set of concentrations is generally higher than the first set, so they produce higher estimates of site risk. Second, both sets of concentrations produce calculated risks that significantly exceed the 1E-04 risk level

for the site. To illustrate this point, consider the two Cs-137 concentrations discussed above. The concentration presented in the first data set is 6,060 pCi/g, and the concentration presented in the second data set is 19,500 pCi/g. The second concentration is a factor of approximately 3 greater than the first concentration, but the first concentration is a factor of 260 greater than the 1E-04 risk-based concentration for Cs-137 (23.3 pCi/g). As a result, the Brass Cap Area Cs-137 risk that would be calculated using the first data set would be 3E-02, and that risk level is well above the 1E-04 risk level used for identifying the Brass Cap Area as a site that should be considered for remediation. In summary, the Brass Cap Area risk results may be overestimated, but less conservative risk estimates for the site would still fall above the acceptable risk level for the site.

Laboratory analysis of individual samples was not conducted, so it is not possible to determine the frequency of detection or the range of concentrations for individual radionuclides. In addition, insufficient depth information is available to calculate depth-specific concentrations. As a result, the above concentrations were assumed to exist in all three depth intervals evaluated in the BRA, i.e., 0–6 in., 0–4 ft, and 0–10 ft (0–15.2 cm, 0–1.2 m, and 0–3. m) (DOE-ID 1996a).

H1-3.1.14 Engineering Test Reactor Stack

The source of the contamination at the Engineering Test Reactor stack is considered to be the tar-conditioning PCBs used to coat the inside of the stack. This tar coating had deteriorated through time and was observed leaking out the north access door. In addition, samples collected by the facility before the OU 2-13 field investigation indicated low levels of PCBs in the soil immediately adjacent to the concrete pad.

During the OU 2-13 investigation, only the PCB Aroclor-1260 was detected in all three samples and the duplicate. Concentrations ranged from 0.073 to 2.3 mg/kg. The analytical data met the requirements of method Validation Level A. The maximum detected concentration of Arocor-1260 (2.3 mg/kg) is below the defined applicable or relevant and appropriate requirements for sites with PCB spills, (i.e., the 25 ppm limit set by TSCA), and within the OSWER directive guidance level of 25 ppm for residual PCBs at Superfund sites. However, the analytical data indicate that the residual PCB contamination remaining in shallow surface soil is greater than the calculated risk-based soil concentration of 0.08 mg/kg for soil ingestion for a residential cancer risk of 10^{-6}.

Aroclor-1260 is the only COPC evaluated in the BRA at the ETR stack site. The Aroclor-1260 concentration evaluated in the BRA is equal to the maximum concentration (2.3 mg/kg) detected at the site during the OU 2-13 RI sampling. This concentration was assumed to exist in all three depth intervals evaluated in the BRA, i.e., 0–6 in., 0–4 ft, and 0–10 ft (0–15.2 cm, 0–1.2 m, and 0–3. m), to produce a conservative estimate of the site's risk (DOE-ID 1996a).

H1-4. WAG 3

H1-4.1.1 WAG 3 Description

WAG 3 is the Idaho Nuclear Technology and Engineering Center (INTEC) that houses reprocessing facilities for federal government defense and research spent fuel. Facilities at INTEC include spent fuel storage and reprocessing areas, a waste solidification area and related waste storage bins, remote analytical laboratories, and a coal-fired steam generating plant.

Potential release sites associated with various facilities at INTEC include sumps, ponds, injection wells, spills, and tank farm storage of hazardous substances. Potential contaminants include organics, radionuclides, metals, corrosives, petroleum waste, and mixed waste.

H1-4.1.2 WAG 3 ERA results

Attachment H1-1 presents a summary of the sites of potential concern for ecological risk assessment.

H1-4.1.3 CPP-13

Site Chemical Processing Plant (CPP)-13 resulted from an air release of calcined, radioactively-contaminated waste and is located on the earthen berm covering underground storage Bin Sets 1 and 2, which contain calcined high-level radioactive waste. While attempting to clear the solids storage cyclone (WC-912) of a restriction on October 26, 1976, the cyclone became overpressurized and blew contaminated granular solids into the air. The release contaminated the roof of building CPP-747 located on the top of the concrete-vaulted storage bin and the berm area to the northeast of CPP-747 and covered and area of 27.9 m^2 (300 ft^2). Elevated levels of radiation are produced by the bin sets, and these levels are apparently greater than any radiation in the soil due to the past release. Surface soil from the bin set area was taken to an area of normal background and surveyed at radioactivity levels ranging between 800 and 3,000 counts per minute (cpm). Subsequent cleanup efforts were successful in decontaminating the top of building CPP-747. However, the contamination over the berm area was left in place and covered with approximately 0.15 m (6 in.) of soil.

Based on the investigative results, Cs-137 and Sr-90 are considered the primary COPCs at CPP-13. Numerous other radionuclides were detected at activities above background; however, these detections were generally limited to boring CPP-13-3. Cs-137 and Sr-90 were both detected at high activity levels to a depth of 1.2 m (4.0 ft) in boring CPP-13-3. Results from a sample collected at boring CPP-13-1 indicated radionuclide activities had dropped to below background in the 2.4 to 3.0-m (8.0 to 10.0-ft) interval. Therefore, the zone of contamination at CPP-13 is assumed to extend throughout the estimated 7.6-m (25-ft) high berm to approximately 0.8 m (2.5 ft) below the base of the berm (original ground surface). The initial area of CPP-13 has been shifted to the west based on the results of the borings. The new area of CPP-13 is 366 m^2 (3,949 ft^2) (DOE-ID 1997b).

H1-4.1.4 CPP-14

The principal features of the treatment plant consisted of two Imhoff digestion tanks, a trickling filter, a chlorine contact basin, sludge drying beds, and a drain field. Raw sewage was initially digested in the Imhoff tank followed by secondary treatment of the effluent in the trickling filter. The digested sludge was transferred to the sludge drying beds, while liquid effluent from the trickling filter was chlorinated and discharged to the drain field.

The sewage treatment facility was demolished as part of the Utility Replacement and Expansion Project (UREP) to upgrade the Idaho National Engineering Laboratory (INEL) facilities. Demolition was completed in September 1983, and reportedly consisted of:

- Removal of the wastewater treatment facilities and associated equipment to a depth of 1.5 m (5 ft) below grade
- Removal and disposal of all remaining sludge in the drying beds
- Removal of all buried piping with the exception of the 0.3-m (12-in.) influent line and the 0.15-m (6-in.) effluent lines from the chorine contact basin to the drain field.

Demolition planning documents stated that salvageable items would be removed and stored, any remaining sludge would be pumped to the new sewage treatment plant (STP), and any structures that were removed would be dismantled and disposed of in the INEEL landfill. The excavated area was backfilled and graded to match the surrounding ground surface.

The influent manhole, ejector pit, Imhoff tanks, final tank, and chlorination tank extended to as deep as 6.1 m (20 ft) belowgrade. The lower portions of these facilities were left abandoned in place. Demolition planning documents stated that drainage holes approximately 0.09 m^2 (1 ft^2) would be cut in the bottoms of all abandoned structures to prevent accumulation of infiltrating surface water. Also left in place were the 0.3-m (12-in.) diameter influent line, the 0.15-m (6-in.) effluent line to the drain field, and the drain field distribution piping.

According to the plot plan for the facility, the "Y" branch in the piping in the drain field is positioned approximately 54.9 m (180 ft) southeast of the former location of the chlorination tank. This would place the drain field piping either directly under or immediately south of building T-6, which is a temporary structure located south of building CPP-664. A 2.4-kV power line, water and sewer lines, as well as a propane tank, are all located within the boundaries of the presumed location of the drain field.

The extent of contamination at the location of the former STP was evaluated, based on the results of sampling. The zone of contamination in the area of the Imhoff tanks is assumed to be 0.9 m (3.0 ft) thick and extends from 2.4 to 3.4 m (8 to 11 ft) bgs. This thickness is based on the initial depth at which sludge was encountering in sampling, and the depth of the base of the tanks. The area of the tanks is 18.6 m^2 (200 ft^2). Radiological COPCs at this substitute include Cs-137, Np-237, U-235, and Sr-90. Of these, Cs-137, Np-237, and Sr-90 were detected at activities above 1.0 pCi/g. Cs-137 activity ranged as high as 6.21±0.16 pCi/g.

The zone of contamination at CPP-14 Plant Site was assumed to be 8.2 m (27 ft) thick. This zone extends from 1.5 to 9.7 m (5.0 to 32.0 ft) bgs. The area of CPP-14 Plant Site measures 900 m^2 (9,860 ft^2). This area is smaller than it was first thought to be. This reduction in size is based on below background activities/concentrations for COPCs in boring CPP-14-14A and lack of evidence that the area between the Plant Site and Drain Field contains contaminated soil. Numerous radiological COPCs were detected in multiple Plant Site area samples. These include Cs-137, U-234, U-238, and Np-237. Of these, U-234 and U-238 were detected at the highest activities, 6.89±0.71 pCi/g and 52.1±1.97 pCi/g, respectively. Cs-137 and Sr-90 detections were also common but at lower activities.

The zone of contamination at the drain field is assumed to extend from 4.3 m (14 ft) to 7.6 m (25 ft) bgs. The top of this interval is based on the depth of the drain field piping. The area of CPP-14 Drain Field is estimated to be 306 m^2 (3,300 ft^2). Radiological COPCs at the drain field are Np-237 and Sr-90. Of these COPCs, only Np-237 was detected above 1 pCi/g. Np-237 reached a maximum activity level of 1.4±0.3 pCi/g (DOE-ID 1997b).

H1-4.1.5 CPP-19

During the graveyard shift on March 9, 1978, a leak was discovered in the waste transfer line from the Basin Liquid Waste Tank (SFE-106) to the Waste Evaporator Feed Tank (WL-102). The leak began at approximately 5:30 a.m. when the transfer pump was started to transfer 13,250 L (3,500 gal) of waste fluid. After the transfer was complete, the waste management operator notified the fuel storage operator that no liquid reached the storage tank (WL-102).

The line was inspected during the day shift on March 9, 1978, by filling the line with water and performing a hydrostatic test. The hydrostatic test forced water out of the breach in the transfer line and up to the ground surface where it pooled. Operating procedures require transfer lines to be hydrostatically tested every 6 months, and this transfer line had a successful test on October 6, 1977. The waste transfer line was constructed of 304 stainless steel that reduced from a 3.81- cm to 3.18-cm (1-1/2- to 1-1/4-in.) diameter and ran for 530 m (0.33 mi) at a depth of approximately 1.5 m (5 ft) bgs. The major area of contamination was estimated at the time to be approximately 10 m^2 (108 ft^2) on the surface. The waste transfer line was abandoned in place after the leak was discovered.

Documentation was not available delineating the exact location of the waste transfer line leak. However, personnel from building CPP-603 familiar with the leak were interviewed to confirm the location. The personnel confirmed the area identified as site CPP-10 as the location where the line leak occurred. The locations of the Track 2 soil borings were based on this information.

Based on investigative results, numerous radionuclides were identified as COPCs for site CPP-19. Cs-137, Sr-90, and isotopes of europium are the most widespread of the COPCs and are found at the highest activity levels. These COPCs range in activity to as high as 408,000 pCi/g for Cs-137 at boring CPP-19-2, drilled at the site of the release. COPCs were detected at activity levels above background in samples collected just above the soil/basalt interface at approximately 9.2 m (31 ft) bgs. The zone of contamination is assumed to extend from the ground surface to the soil/basalt interface (DOE-ID 1997b).

H1-4.1.6 CPP-34

In the summer of 1983, about 9,180 m^3 (12,000 yd^3) of contaminated soil was excavated from around the WL-102 tank and stockpiled at a site to the east of building CPP-603. According to the environmental evaluation report, the external exposure readings from the contaminated soil were generally 2 to 3 mR/hr, with maximum readings of less than 30 mR/hr. In August and September 1984, the pile of contaminated soil was removed from the location east of CPP-603 and buried in three trenches in the northeastern corner of the Idaho Chemical Processing Plant (ICPP), situated between the animal (outer) and security (inner) fences. The trenches are situated parallel to the animal fences; one in an east-west direction, that abuts to one of the other two trenches that are parallel to the fence in a north-south direction. The dimensions of the trenches are 13.7 m (45 ft) wide at the top, 7.6 m (25 ft) wide at the bottom, and approximately 4.3 to 4.9 m (14 to 16 ft) deep. The length of the trenches is 126 m (413 ft), 122 m (400 ft), and 74 m (242 ft). It was reported in the Track 1 that at the time of disposal the contamination soil in the trenches was covered with approximately 0.6 m (2 ft) of clean soil.

Based on the investigative results, the primary COPCs at this site are Cs-137 and Sr-90. These COPCs were detected at concentrations well above background in the soil backfilled in the trenches. Highest concentrations of these radionuclides are primarily at depths between 1.8 to 3.7 m (6 to 12 ft) and extend downward to 4.9 m (16 ft) in the area of boring CPP-34-01. Concentrations of these radionuclides decrease with depth but are still above background at 5.5 to 6.1 m (18 to 20 ft) in most areas. Although the contaminated soil in the trenches was reportedly covered with 0.6 m (2 ft) of clean fill, concentrations of Cs-137 and Sr-90 are above background in surficial soil at all four boring locations. The zone of contamination assumed for this site is from 0 to 6.1 m (0 to 20 ft). The volume of contaminated soil was estimated to be 20,912 m^3 (738,500 ft^3) for the purpose of calculating a source term for the model using the reported dimensions of the trenches. An average width of the trench (10.7 m [35 ft]) was used as the width of the trench varied from 13.7 m (45 ft) to 7.6 m (25 ft) (DOE-ID 1997b).

H1-4.1.7 CPP-37

Pit 1 (CPP-37A) is located outside of the ICPP security fence and measures approximately 43 m (140 ft) in width × 64 m (210 ft) in length and is 4.3 m (14 ft) in depth. No information is available on the date pit usage began; however, Pit 1 was used for decontamination of radiologically contaminated construction equipment during July and October 1983. In addition, during 1982 and 1983, the pit was used as a percolation pond for ICPP service wastewater while the injection well was being refitted. Grab samples from the service waste contained no radionuclides or hazardous chemicals. This pit currently receives stormwater runoff from the ICPP.

The reported release to the pits included wastewater discharge, potentially contaminated construction debris, decontamination operations, and possibly chemical waste. The extent of contamination related to them would be expected to remain within the lateral boundaries of the pit. Liquids discharged to one or both of the pits included service waste and effluent from the sludge dewatering pit of the old STP. Currently, stormwater runoff drains into Pit 1. The more mobile contaminants (i.e., those that would migrate with infiltrating water) may have already migrated downward. However, the only radionuclide detected between a depth of 6.1 m (20 ft) and the top of basalt was Sr-90 in two of the four borings at Pit 2. No radionuclides were detected in the sample from the 110-ft interbed beneath Pit 2. The contaminated zone for Pit 2 is assumed to be from 1.5 to 10.1 m (5 to 33 ft). Soil samples deeper than 1.8 m (6 ft) were collected only in one boring at Pit 1. Radionuclides were not detected above background from samples collected below a depth of 3.1 m (10 ft). The contaminated zone at Pit 1 is assumed to extend from 0 to 3.0 m (10 ft). The areas of Pit 1 and Pit 2 are 2,731 m^2 (29,4000 ft^2) and 9,179 m^2 (98,800 ft^2), based on the dimensions reported in the Track 2. Contaminated soil volumes in the pits were estimated for the purpose of calculating source terms for the model based on the above depth intervals and the reported dimensions of the pits (DOE-ID 1997b).

H1-4.1.8 CPP-40

Site CPP-40 consisted of a 18.9-m (62-ft) long drain pipe, a neutralization pit (lime pit), and a discharge pipe. The drain pipe led from a large drip pan in building CPP-601 to the neutralization pit. The drip pan was intended to catch leaks and spills of hydrofluoric acid and other miscellaneous chemicals.

The neutralization pit was a metal-lined concrete box approximately 1.8 × 1.8 m (6 × 6 ft) in area, and 2.1 m (7 ft) deep. Powdered limestone was periodically added to the neutralization pit while it was operational to neutralize hydrofluoric acid. In addition, water was added to the neutralization pit to dilute the hydrofluoric acid. Although discharge from building CPP-601 was reportedly discontinued in 1985, water continued to flow into the neutralization pit until August 22, 1990. Overflow from the neutralization pit was discharged through a pipe to the soil column. The pipe extended to a depth of 0.88 m (2.9 ft) bgs. The drain pipe, neutralization pit, and discharge pipe have been removed as described below.

The objective of the RI/FS sampling at this site conducted during the summer of 1995 was to confirm the effectiveness of previous removals and evaluated the presence of this contamination. This recent investigation could not confirm the presence of residual contamination because only two out of the three samples measured Cs-137 at levels slightly above background and below the risk-based level (2.3 pCi/g). Therefore, the decision was made not to evaluate this site quantitatively in the BRA (DOE-ID 1997b).